



## Case Report



# Evaluation of Giardiasis in Companion Birds in Mashhad, Iran

Farzin Kazemi Lifshagerd<sup>1</sup> , Omid Behrouzi Nasab<sup>2,\*</sup> , Alireza Koochakzadeh<sup>3,4</sup> , and Majid Kazemnezhad<sup>3</sup>

<sup>1</sup> Faculty of Veterinary Medicine, Ferdowsi University, Mashhad, Iran

<sup>2</sup> Department of Clinical Sciences, Faculty of Veterinary Medicine, Shahid Chamran University of Ahwaz, Ahwaz, Iran

<sup>3</sup> Aban Veterinary Clinic, Mashhad, Iran

<sup>4</sup> Department of Microbiology, Faculty of Veterinary Medicine, University of Tehran, Tehran, Iran

\* **Corresponding author:** Omid BehrouziNasab, Department of Clinical Sciences, Faculty of Veterinary Medicine, Shahid Chamran University of Ahwaz, Ahwaz, Iran. Email: [omid.behrouzinhasab@alumni.um.ac.ir](mailto:omid.behrouzinhasab@alumni.um.ac.ir)

## ARTICLE INFO

### Article History:

Received: 05/08/2023

Accepted: 07/09/2023



### Keywords:

*Giardia*

Metronidazole

Protozoa

Psittaciformes

## ABSTRACT

**Introduction:** *Giardia* spp. are parasitic protozoans that infect the digestive system of ornamental birds, especially in Psittaciformes, with different prevalence in various species. Symptoms of *Giardia* infection vary from no noticeable signs in adult birds to poor growth, weakness, anorexia, ruffled feathers, and diarrhea in chicks. This study aimed to evaluate the prevalence of giardiasis in some parrots referred to a private veterinary clinic in Mashhad during 2022.

**Case report:** Feces of 215 birds suspected of being infected with *Giardia* spp. were collected. The birds were visited at one of the clinics in Mashhad, Iran, in 2022. Wet smear was prepared from their fresh feces and then sent to the laboratory department of the clinic for diagnosis. The parrots included adult cockatiels, cockatiel chicks, lovebirds, African grey parrots, and Green-cheeked parakeets. After the final diagnosis, metronidazole was administered orally at a dosage of 50 milligrams per kilogram of body weight every 12 hours for 5 consecutive days. Sick birds were tested again after the treatment to confirm they were parasite-free. The obtained results of the laboratory indicated 60 positive Cockatiels (47.6%), 10 positive cockatiel chicks (43.4%), 4 positive lovebirds (14.2%), 2 Green-cheeked parakeets (8.6%), and only 1 positive African grey parrot (6.6%). Among the positive cases, the severity of infection varied, with some birds showing severe, moderate, or mild infection levels. Upon a second examination, birds with mild and moderate contamination were found to be disease-free, while those with severe contamination required further treatment.

**Conclusion:** The results suggested that treatment with metronidazole for 5 consecutive days was effective against mild to moderate infection in sick parrots. However, birds with severe conditions need to continue the treatment procedure.

## 1. Introduction

*Giardia* spp. are parasitic protozoans of the digestive system with varying prevalence rates in different species of ornamental birds and are common in wild and captive birds<sup>1,2</sup>. Different species of *Giardia* known in birds are *G. psittaci*, *G. duodenalis*, and *G. ardeae*<sup>3</sup>. *Giardia psittaci* and *G. ardeae* are specific to birds and not transmissible to humans<sup>4</sup>. Giardiasis in ornamental birds has been reported mainly in parrots, including cockatiels (*Nymphicus hollandicus*), lovebirds (*Agapornis*), budgerigars (*Melopsittacus undulatus*), and African grey

parrots (*Psittacus erithacus*)<sup>5</sup>. Giardiasis is a common parasitic disease in cockatiels and parakeets, but most infected birds, such as adult cockatiels and budgerigars, are asymptomatic carriers<sup>6</sup>. *Giardia* spp. is one of the common causes of weakness and lethargy in ornamental psittaciformes, especially in breeding centers. The most effective way to prevent disease is to maintain cage hygiene in breeding centers and prevent direct contact of birds with feces<sup>7</sup>.

The main ways of transmitting the parasite are



**Figure 1.** Feather-picking patterns in an adult female cockatiel

through contaminated water, soil, food, and direct contact of the bird with feces containing parasite cysts or trophozoites<sup>4,8</sup>. Adult birds are relatively resistant to disease and appear to be healthy. They can also transmit infection to other birds and their chicks through cysts and trophozoites in their feces<sup>4</sup>. Although it is common in psittaciformes, giardiasis is considered rare in other captive birds<sup>4</sup>. Giardiasis is a minor zoonotic disease that causes self-limiting infection in humans (*G. duodenalis*)<sup>9</sup>.

Symptoms of *Giardia* infection range from no clinical signs in adult birds to poor growth and weakness, anorexia, ruffled feathers, and diarrhea in 3-6 month-old chicks with *Chlamydia psittaci* confection<sup>1,9-11</sup>. In cockatiels and budgerigars, feather-picking patterns with screaming have been reported in different areas, particularly the carpal-metacarpal, flank, axilla, and lower leg<sup>4</sup> (Figure 1, 2). In cockatiels, cockatiel feather mutilation syndrome is associated with giardiasis and causes dry, flaky skin and alopecia<sup>12</sup> (Figure 3).



**Figure 2.** feather-picking patterns in an adult female cockatiel



**Figure 3.** Dry, flaky skin and alopecia in the same cockatiel

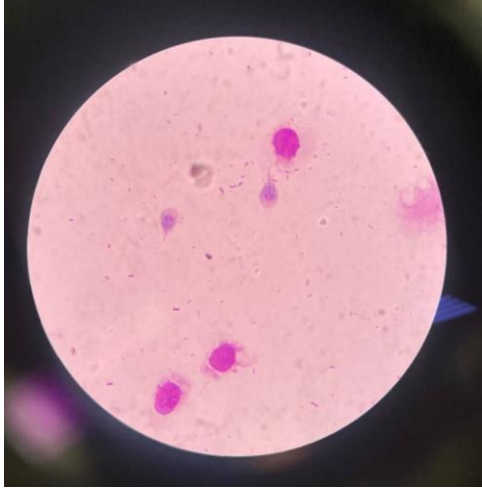
The diagnosis of the disease is typically made by observing clinical symptoms and conducting diagnostic tests that include the preparation of a wet smear from fresh feces (collected within 10 minutes of defecation), polymerase chain reaction (PCR), and flotation methods<sup>1</sup>. Motile trophozoites or parasite cysts can be seen in the wet smear of an infected bird's feces. When the stool sample is not fresh, the probability of observing trophozoites decreases<sup>7</sup>.

In order to treat the disease, Nitroimidazoles, such as metronidazole, are recommended<sup>4</sup>. The recommended dosage for metronidazole is 50 milligrams per kilogram of body weight every 12-24 hours in the oral route<sup>4</sup>. As intestinal infections, such as giardiasis, may block vitamin absorption (vitamins E and A)<sup>11</sup>, it is necessary to provide these vitamins in the treatment process. For this purpose, Vitamin AD<sub>3</sub>E should be administered in drinkable water<sup>11</sup>. Treating healthy birds, reducing the humidity of the cage floor, and not allowing the chicks to come into contact with feces are ways to prevent and control the disease. *Giardia* cysts are inactivated by quaternary ammonium compounds<sup>1</sup>. The sick birds should simultaneously be monitored for secondary bacterial and fungal infections until recovery. The primary aim of this research was to assess the frequency of giardiasis among a selection of parrots that were brought to a veterinary clinic in Mashhad throughout the year 2022.

## 2. Case report

This study was conducted from January to December 2022 to provide information about the prevalence of *giardia* in psittacines referred to a private veterinary clinic in Mashhad, Iran.

About 0.3 gr of feces were collected from 215 birds exhibiting clinical signs suggestive of *Giardia* spp. infection during their visit to the Aban Veterinary Clinic in



**Figure 4.** Confirmation of giardiasis infection in an adult female cockatiel using Gram staining - light microscopy -  $\times 1000$  magnification

Mashhad in 2022. A wet smear was prepared from their fresh feces and then sent to the laboratory department of the clinic for diagnosis. Birds with clinical symptoms, such as weight loss, depression, ruffled feathers, chronic diarrhea included 126 adult Cockatiels, 23 Cockatiel chicks, 23 adult green-cheeked parakeets, 15 adult African Grey parrots, and 28 adult Lovebirds. The wet smear was prepared in the laboratory and observed with 40, 100, and 400 magnifications using a light microscope (JENUS, China). In one case, Gram staining was done to confirm and take a photo (Figure 4). After the final diagnosis, metronidazole was administered orally at a dose of 50 mg/kg of body weight every 12 hours for 5 consecutive days and Vitamin AD<sub>3</sub>E 1 cc/liter in drinkable water for 3 days. After 7 days of receiving treatment, a reassessment was conducted on all the previously infected birds. The evaluation took into account their clinical symptoms and also involved collecting samples for direct microscopy.

The result of examining the stool smear of suspected birds from the laboratory was published at three levels of mild, moderate, and severe contamination. A total of 60 positive cockatiels (47.6%), 10 positive cockatiel chicks (43.4%), 4 positive lovebirds (14.2%), 2 green-cheeked parakeets (8.6%), and 1 positive African grey parrot (6.6%) were reported. Among 60 cockatiels, 11 cases had severe infection, 18 cases had the moderate infection, and 31 cases had mild infection. Among the 10 cockatiel chicks, 2 were diagnosed with severe *Giardia* infection, 6 had moderate infections, and 2 had mild infections. The two green-cheeked parakeets that tested positive for giardiasis exhibited only mild infection. The sole African grey parrot with a confirmed *Giardia* infection also had a mild case. One of the four sick lovebirds had a moderate infection, while three had mild infections. After the second examination, the birds with mild and moderate infections were completely free of the disease. However, those birds with severe infections required additional rounds of treatment, indicating a need for continued care and monitoring to ensure their recovery from *Giardia* infection.

### 3. Discussion

Previous studies have indicated that the prevalence of *Giardia* cysts in free-ranging birds is significantly higher than in captive or domestic birds<sup>10</sup>. In the current study, which aimed to investigate the prevalence of giardiasis in a group of captive parrots with health issues, the parasite was identified in 35.8% of samples using light microscopy. The prevalence varied between 6.6% and 47.6%, depending on species and age. This percentage was 52.7% in Japan<sup>13</sup>, which is compatible with the present study.

During the summer seasons of 2017 and 2018 in Chile, the Monk Parakeets were found to have a giardiasis prevalence rate of 12%<sup>14</sup>. Similarly, in Iraq, Khalil<sup>15</sup> detected giardia in 10% of all tested parrots. Additionally, Papini et al.<sup>12</sup> reported a giardiasis prevalence of 5.3% among all examined healthy birds in Italy infected with *G. duodenalis*. It is worth noting that these studies focused on birds that were generally healthy, which may explain the lower detection rates when compared to the present study. This contrast underscores the importance of considering the health condition of the sampled birds in research, as it can significantly impact the observed prevalence of the disease.

Furthermore, it is important to recognize that the results of such studies can be influenced by various factors, including the number of samples, time of sample collection and examination, humidity, temperature, environment, as well as the health status of the bird. According to the above explanations, the most important reason for the difference in the results of the present study and those of other researchers is that all the samples of the current research were taken from birds that indicated signs of illness, such as lethargy, depression, and chronic diarrhea and sampling was not done from asymptomatic birds.

### 4. Conclusion

The obtained result of the current study has indicated that metronidazole is effective in treating mild to moderate cases of the disease. However, a more comprehensive approach may be required in severe cases, such as extending the treatment duration, repeating the treatment, or considering alternative drugs (Carnidazole 30 mg/kg PO or Ronidazole 10 mg/kg PO for 7 days). Moreover, the role of Vitamin AD<sub>3</sub>E appears to be significant in the recovery of sick birds. Due to the high degree of reversibility of the disease, it is necessary to evaluate sick birds after the treatment period and then regularly according to the discretion of the veterinarian to ensure their recovery.

### Declarations

#### Competing interest

There is no conflict of interest.

#### Authors' contribution

The initial examination and sampling were performed

by Omid BehrouziNasab and Majid Kazemnezhad. Laboratory tests were conducted by a team consisting of Alireza Koochakzadeh, Omid BehrouziNasab, and Farzin Kazemi Lifshagerd. The conceptualization of the project was a collaborative effort between Alireza Koochakzadeh, Omid BehrouziNasab, and Farzin Kazemi Lifshagerd while the investigation phase was led by Farzin Kazemi Lifshagerd and Omid BehrouziNasab. Project administration responsibilities were shouldered by Alireza Koochakzadeh and Omid BehrouziNasab. The original draft was written by Kazemi Lifshagerd. The final stage of writing, including review and editing, was undertaken by Omid BehrouziNasab. All authors read and approved the final draft of the manuscript.

### Funding

No funding.

### Ethical considerations

The study was conducted in accordance with the international standards and regulations regarding the ethical use of animals in scientific research. Ethical issues (including plagiarism, consent to publish, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancy) have been checked by all the authors.

### Acknowledgments

The authors wish to acknowledge everyone who helped while writing this manuscript.

### References

1. Abe N, Makino I, and Kojima A. Molecular characterization of *Giardia psittaci* by multilocus sequence analysis. *Infect Genet Evol.* 2012; 12(8): 1710-1716. DOI: [10.1016/j.meegid.2012.08.003](https://doi.org/10.1016/j.meegid.2012.08.003)
2. Reboredo-Fernandez A, Ares-mazás E, Cacciò SM, and Gómez-couso H. Occurrence of *Giardia* and *Cryptosporidium* in wild birds in Galicia (Northwest Spain). *Parasitology.* 2015; 142(7): 917-925. DOI: [10.1017/S0031182015000049](https://doi.org/10.1017/S0031182015000049)
3. Ryan U, and Cacciò SM. Zoonotic potential of *Giardia*. *Int J Parasitol.* 2013; 43(12-13): 943-956. DOI: [10.1016/j.ijpara.2013.06.001](https://doi.org/10.1016/j.ijpara.2013.06.001)
4. Doneley B. *Avian medicine and surgery in practice: Companion and aviary birds.* 2nd ed. Boca Raton: CRC press; 2018. DOI: [10.1201/9781315371047](https://doi.org/10.1201/9781315371047)
5. Schmidt R, Reavill D, and Phalen D. *Gastrointestinal system and pancreas. Pathology of pet and aviary birds.* 2nd ed. John Wiley & Sons, Inc; 2003. p. 55-94.
6. Hosseini SA. Zoonotic diseases associated with pet birds. *J Zoonotic Dis.* 2022; 6(3): 91-112, DOI: [10.22034/jzd.2022.15461](https://doi.org/10.22034/jzd.2022.15461)
7. Doneley RJT. Bacterial and parasitic diseases of parrots. *Vet Clin N Exot Anim Pract.* 2009; 12(3): 417-432. DOI: [10.1016/j.cvex.2009.06.009](https://doi.org/10.1016/j.cvex.2009.06.009)
8. Filippich LJ, McDonnell PA, Munoz E, and Upcroft JA. *Giardia* infection in budgerigars. *Aust Vet J.* 1998; 76(4): 246-249. DOI: [10.1111/j.1751-0813.1998.tb10148.x](https://doi.org/10.1111/j.1751-0813.1998.tb10148.x)
9. McRoberts KM, Meloni BP, Morgan UM, Marano R, Binz N, Erlandsen SL, et al. Morphological and molecular characterization of *Giardia* isolated from the straw-necked ibis (*Threskiornis spinicollis*) in Western Australia. *J Parasitol Res.* 1996; 82(5): 711-718. DOI: [10.2307/3283880](https://doi.org/10.2307/3283880)
10. Majewska AC, Graczyk TK, Słodkiewicz-Kowalska A, Tamang L, Jedrzejewski S, Zduniak P, et al. The role of free-ranging, captive, and domestic birds of Western Poland in environmental contamination with *Cryptosporidium parvum* oocysts and *Giardia lamblia* cysts. *Parasitol Res.* 2009; 104: 1093-1099. DOI: [10.1007/s00436-008-1293-9](https://doi.org/10.1007/s00436-008-1293-9)
11. Tully TN, Dorrestein GM, and Jones AK, editors. *Handbook of avian medicine.* New York: Elsevier, Saunders; 2009. Available at: <https://cir.nii.ac.jp/crid/1130282272956430592>
12. Papini R, Girivetto M, Marangi M, Mancianti F, and Giangaspero A. Endoparasite infections in pet and zoo birds in Italy. *Sci World J.* 2012; 2012: 253127. DOI: [10.1100/2012/253127](https://doi.org/10.1100/2012/253127)
13. Yamashita T, Hirai K, Shimakura S, ITOH K, HIRATA A, and HASHIMOTO A. *Recent occurrence of chlamydiosis and giardiasis in budgerigars (Melopsittacus undulatus) in Japan.* *Jpn J Vet Sci.* 1981; 43(6): 963-965. DOI: [10.1292/jvms1939.43.963](https://doi.org/10.1292/jvms1939.43.963)
14. Sandoval-Rodríguez A, Marcone D, Alegría-Morán R, Larraechea M, Yévenes K, Fredes F, et al. *Cryptosporidium* spp. and *Giardia* spp. in free-ranging introduced monk parakeets from Santiago, Chile. *Animals.* 2021; 11(3): 801. DOI: [10.3390/ani11030801](https://doi.org/10.3390/ani11030801)
15. Khalil N. Prevalence of *Giardia* spp in pet shop birds. *J Vet Res.* 2018; 22(8): 736-738. Available at: <https://www.cabdirect.org/cabdirect/abstract/20193021023>